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Fate of Salmonella Typhimurium in laboratory-scale drinking water biofilms

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Abstract

Investigations were carried out to evaluate and quantify colonization of laboratory-scale drinking water biofilms by a chromosomally green fluorescent protein (gfp)-tagged strain of Salmonella Typhimurium. Gfp encodes the green fluorescent protein and thus allows in situ detection of undisturbed cells and is ideally suited for monitoring Salmonella in biofilms. The fate and persistence of non-typhoidal Salmonella in simulated drinking water biofilms was investigated. The ability of Salmonella to form biofilms in monoculture and the fate and persistence of Salmonella in a mixed aquatic biofilm was examined. In monoculture S. Typhimurium formed loosely structured biofilms. Salmonella colonized established multi-species drinking water biofilms within 24 hours, forming micro-colonies within the biofilm. S. Typhimurium was also released at high levels from the drinking water-associated biofilm into the water passing through the system. This indicated that Salmonella could enter into, survive and grow within, and be released from a drinking water biofilm. The ability of Salmonella to survive and persist in a drinking water biofilm, and be released at high levels into the flow for recolonization elsewhere, indicates the potential for a persistent health risk to consumers once a network becomes contaminated with this bacterium.